SUGAR BEET (*Beta vulgaris* spp *vulgaris*)
Rhizoctonia root rot; *Rhizoctonia solani*

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PUBLICLY RELEASED SUGAR BEET GERMPLASM EVALUATED FOR RESISTANCE TO RHIZOCTONIA-ROOT-ROT, 2000: Thirty-seven sugar beet germplasm released over the past 30 years, or under development by the USDA-ARS Sugar Beet Research Unit located in Fort Collins, CO were evaluated for resistance to Rhizoctonia root rot. The trial was a randomized, complete-block design. One-row plots, replicated five times were planted in Windsor, CO, on 16 May. Plots were 4.5 m long with 56 cm between rows and 20 to 25 cm within-row spacing. Inoculation with dry, ground, barley-grain inoculum of *Rhizoctonia solani* AG 2-2 isolate R-9 was performed on 12 Jul; immediately after inoculation, a cultivation was performed to throw soil into the beet crowns. The field was thinned by hand and irrigated as necessary. Beets were harvested 31 Jul through 2 Aug. Each root was rated for rot on a scale of 0 (no damage) to 7 (dead). Analyses of variance (PROC ANOVA - SAS) were performed on disease indices (DIs), percent healthy roots (undamaged classes 0 and 1 combined), and percentage of roots in classes 0 thru 3 (those most likely to be harvested and taken to the factory). Percentages were transformed using arcsin-square root to normalize the data for analyses ("AP 0-1" and "AP 0-3" in the accompanying table). Both percentages and transformations are given in the table.

We had unusually high temperatures in the summer of 2000 which, combined with a high inoculum load, contributed to a severe root rot epidemic. The *Rhizoctonia* epidemic progressed very quickly, becoming severe by the end of July. Differences in DIs among entries were highly significant ($P < 0.001$). Mean DIs across all tests in the 2000 nursery for highly resistant FC705-1, resistant FC703, and highly susceptible FC901/C817 controls were 2.5, 2.7, and 4.4 respectively. Percentages of healthy roots were 16.0, 16.3, and 3.9% for these controls. Percentages of roots in disease classes 0 thru 3 were 79.9, 67.1, and 28.7, respectively. The highest and lowest DIs for the evaluated lines were 6.4 and 1.7, respectively. The resistant and highly resistant checks were developed and released in 1976 and 1983, respectively. A number of germplasm performed as well as these but none significantly better than FC705-1.

Germplasm	Seed Source	Year Released – Crop Science (CS) Reference – Comments	DI	% 0-1*	% 0-3*	AP 0-1*	AP 0-3*
		$LSD_{P=0.05}$	0.95			13.30	25.90
FC701	931024	1968 -- PI 590660 CS 12:400	3.7	0	36	0.0	33.4
FC701-4	761068H	1976 – PI 590663 CS 17:678	3.2	3	60	4.2	50.8
FC701-5	721056	experimental – 6 cycles of selection from GW 674-56C	3.4	12	49	10.2	47.3
FC701-6	801059H	1983 -- PI 590756 CS 25:374	3.1	11	56	11.8	46.1
FC702-2	991016	1968 Sugar Beet Research 1968:A3	3.6	6	49	10.8	44.5
FC702	681009-0	1968 -- PI 590662 CS 12:400	4.1	0	33	0.0	30.0
FC702-6	811055H	1981 -- PI 590703 CS 22:454	3.1	16	58	12.7	52.7
FC703	**751080H**	**1976 – PI 590656 CS 17:678 Resistant Check**	**3.8**	**3**	**39**	**4.9**	**38.3**
FC704	931021	1978 -- PI 590659 CS 19:934-935	3.3	5	63	8.4	53.4
FC705-1	**831083**	**1983 – PI 590754 CS 25:374 Highly Resistant Check**	**3.1**	**13**	**69**	**16.3**	**59.8**
FC705	781066H	1978 – PI 590660 CS 19:935	3.3	3	63	4.2	52.6
FC708	831085HO	1980 – PI 590845 CS 21:802	3.5	2	57	3.7	49.2
FC709	891026H	1987 – PI 518643 CS 28:1039	2.2	25	98	29.4	86.5
FC709-2	921024	1999 – PI 599668 CS 39:298-299	2.8	11	81	15.1	70.1
FC710	891033	1990 – PI 542971 CS 31:494	3.5	2	54	3.7	47.8
FC710(4X)	971017	experimental -- FC710 colchicine doubled	3.6	0	32	0.0	30.7
FC711	821087	1982 – PI 590729 CS 23:601-602	3.5	0	53	0.0	46.9
FC712	881032H	1985 – PI 590766 CS 26:213-214	3.7	5	42	6.0	37.4
FC712(4X)	971018	experimental -- FC 712 colchicine doubled	3.0	6	69	9.3	60.2
FC715	911026HO	1992 – PI 574625 CS 34:290	4.3	2	33	3.5	34.4
FC716	971019	1992 – PI 574627 CS 35:291	3.1	9	63	13.0	55.6
FC717	911031	1992 – PI 574628 CS 35:291	4.3	0	19	0.0	20.3
FC718	911032	1992 – PI 574629 CS 35:291	3.0	2	78	3.3	65.9
FC719	911037	1992 – PI 574630 CS 35:291	2.8	9	69	15.3	57.4
FC720-1	961015	experimental -- C718/(C718/FC708)	4.0	3	36	4.6	36.1
FC722-1	961010HO	experimental -- C718/FC708	4.2	0	25	0.0	26.1
FC722CMS	961010HO1	experimental -- C718/FC708 CMS	4.2	0	19	0.0	17.2
FC723	951016HO	experimental -- EL44/FC708 mm	4.1	2	28	3.5	31.3
FC723CMS	951016HO1	experimental -- EL44/FC708 CMS	4.3	0	33	0.0	30.2
FC724-1	961014	experimental -- FC702/LSR-CTR	3.1	5	67	6.0	61.7
FC725	921008	1995 – PI 591314 CS 36:819-820	3.3	4	60	5.5	51.6
FC726	931010	1995 – PI 591315 CS 36:819-820	2.7	19	79	22.1	66.2
FC727	951017	1999 – PI 599669 CS 39:298-299	3.7	4	45	7.4	42.8
FC728	921025	1995 – PI 591316 CS 36:819-820	3.4	6	54	10.9	48.1
FC729	921019	FC712/A4, 3 cycles Rhizoc, MM	3.5	6	55	8.7	50.8
FC801	991015	1971 – W6 17140 F_4, FC 901 (LSR-CTR) x SP 631001-0	3.9	0	45	0.0	44.7
FC907-1	971020	experimental -- FC607/FC701 BC_4	4.8	0	11	0.0	16.8
	931017	**Susceptible Check - (FC901/C817)**	**5.5**	**0**	**3**	**0.0**	**5.9**

* DI = Disease Index on a scale of 0 (no damage) to 7 (plant death), % 0-1= percent healthy roots, % 0-3 those roots most likely to be harvested and taken to the factory. AP is the arcsin-square root transformation of percentages to normalize the data for analyses.